Homicide: A Leading Cause of Injury Deaths Among Pregnant and Postpartum Women in the United States, 1991–1999

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Objectives. We identified risk factors for pregnancy-associated homicide (women who died as a result of homicide during or within 1 year of pregnancy) in the United States from 1991 to 1999.

Methods. Pregnancy-associated homicides were analyzed with data from the Pregnancy Mortality Surveillance System at the Centers for Disease Control and Prevention.

Results. Six hundred seventeen (8.4%) homicide deaths were reported to the Pregnancy Mortality Surveillance System. The pregnancy-associated homicide ratio was 1.7 per 100 000 live births. Risk factors included age younger than 20 years, Black race, and late or no prenatal care. Firearms were the leading mechanism for homicide (56.6%).

Conclusions. Homicide is a leading cause of pregnancy-associated injury deaths. (*Am J Public Health.* 2005;95:471–477. doi:10.2105/AJPH.2003.029868)

Although the pregnancy-related mortality ratio, defined as the number of deaths caused by pregnancy complications per 100 000 live births, has remained relatively unchanged in the United States over the past 20 years, the number of injury-related deaths during pregnancy and the postpartum period is being increasingly recognized and studied, particularly deaths caused by homicide. In 1999, homicide was the third leading cause of injury-related death for all women (pregnant or not pregnant) of reproductive age, 15 to 44 years of age, after deaths caused by motor vehicle accidents and suicide, and it was the second leading cause of injury-related death among women aged 15 to 24 years and among Black women of reproductive age.[1] Moracco and Runyan reported the highest homicide rate occurring among women under the age of 35 and found that the homicide rate for Black women (15.8 per 100 000) was more than 3 times higher than that for White women (4.3 per 100 000).[2]

Several state- and city-based studies have recently reported that homicide is a leading cause of death during pregnancy and in the postpartum period.[3–9] One inner-city hospital study indicated that homicide has become the leading cause of death during or within 90 days of the end of pregnancy.[10] However, studies have not been conducted at the national or regional level that focus on the identification of risk factors for and groups at high risk of homicide during pregnancy or in the postpartum period. Our report describes homicide deaths occurring during or within 1 year of pregnancy in the United States from 1991 through 1999. We used a national, population-based data set to identify characteristics and risk factors associated with these deaths.

METHODS

In 1987, the Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion at the Centers for Disease Control and Prevention (CDC), in collaboration with the American College of Obstetricians and Gynecologists and state health departments, established the Pregnancy Mortality Surveillance System (PMSS) to collect data on all reported deaths that occurred during pregnancy or within 1 year of pregnancy.[11] Beginning with deaths occurring in 1991, the Division of Reproductive Health requested certificates for deaths that occurred during pregnancy or within 1 year of pregnancy, regardless of the cause of death. In addition, reporting areas were asked to search for and send "all injury-related death certificates" for deaths that occurred during pregnancy or within 1 year of pregnancy. The manner in which each reporting area responded to this request varied. Three methods were used to establish this temporal relation between a woman's death and pregnancy: (1) a pregnancy check box marked on the death certificate, (2) pregnancy status indicated on the death certificate using pregnancy-associated key words to describe the woman or the cause of death (e.g., pregnant, cesarean section, labor, postpartum, delivery, placenta, and obstetric and other terms that indicate pregnancy), or (3) the death certificate of the reproductive-aged woman matched with a birth certificate or fetal death certificate for a delivery that occurred within 1 year of the woman's death. A pregnancy-associated death is defined as one occurring during or within 1 year of pregnancy. Pregnancy-related deaths are those pregnancy-associated deaths that are also causally related to pregnancy, that is, they are the result of (1) complications of the pregnancy, (2) a chain of events that was initiated by the pregnancy, or (3) the aggravation of an unrelated condition by the physiological effects of the pregnancy or its management.[11] A pregnancy-associated homicide is defined as a pregnancy-associated death that was attributed to homicide as the manner of death or immediate cause of death.

Each year, health departments in the 50 states, the District of Columbia, and New York City voluntarily provide the CDC with

de-identified copies of death certificates and, for those deaths following a live birth or stillbirth, matching birth or fetal death certificates. Furthermore, state maternal mortality review committees, the media, and individuals report a few cases not otherwise identified. Each death is reviewed and confirmed by medical epidemiologists at the CDC as to cause of death, associated conditions, and the outcome of the pregnancy (i.e., live birth, stillbirth, ectopic pregnancy, abortion [induced and spontaneous], or gestational trophoblastic neoplasia). Because *International Classification of Diseases* codes[12,13] are rarely available on the death certificates the CDC receives, the PMSS uses all available information from the death, birth, and fetal death certificates and any accompanying materials such as autopsy or maternal mortality review committee reports to assign a cause of death. The PMSS coding system, which includes codes for intentional (homicide and suicide) and unintentional injury (motor vehicle accidents, falls, burns, and other injuries caused by natural or environmental factors), is used. The PMSS uses limited variables that were available from our data sources to examine potential risk factors associated with pregnancy-associated deaths from homicide.

Pregnancy-associated homicide ratios were defined as the number of pregnancy-associated homicide deaths obtained from the PMSS (numerator) per 100 000 live births (denominator) obtained from the national natality files compiled by the CDC's National Center for Health Statistics.[14] The ratios were calculated using data from 1991 through 1999 for both the numerator and the denominator. Also, for both the numerator and the denominator of pregnancy-associated homicide ratios, race was defined as the race of the mother and classified as White, Black, or other. Other races included Asian/Pacific Islander, American Indian/Alaska Native, and those reported as "other." The women's ages at the time of death were grouped into standard 5-year intervals. Education information was obtained from the death, birth, or fetal death certificates and was based on total years of education completed at the time of death. Because many women younger than 20 years would not be expected to have completed high school, the analysis of education was restricted to women aged 20 years or older. In addition, the state of Georgia did not report maternal education during 3 years of the surveillance period (1997–1999); therefore, women younger than 20 years and women who died in Georgia were excluded from analyses by education. Marital status was categorized as married (currently married) or unmarried (never married, divorced, separated, or widowed).

When available, time of death was defined as the number of days between the date of delivery/pregnancy termination (e.g., live birth, stillbirth, and abortion) and the date of homicide and categorized as follows: 0–3 months, >3–6 months, >6–9 months, and >9–12 months. Information on prenatal care and live birth order were limited to homicide deaths that occurred after delivery of live-born or stillborn infants, because these data were not otherwise available (e.g., for ectopic pregnancies and other undelivered events). Onset of prenatal care was categorized as initiation in the first, second, or third trimester, or no prenatal care. Live birth order, defined as the number of live births, including the index pregnancy that the woman had delivered, was examined, because it is included on the national natality files.[14] In addition, if available, information on the mechanisms used for homicide was obtained from the death certificates.

RESULTS

For the years 1991 through 1999, 7342 deaths were reported to the PMSS. A majority of the reported deaths (n=4200 [57.2%]) were pregnancy-related (e.g., they occurred during or within 1 year of pregnancy and were causally related to pregnancy).[15] A total of 1993 deaths (27.1%) were pregnancy associated and injury related. The remaining 1149 (15.7%) deaths included those that were pregnancy associated but not caused by injuries or pregnancy complications and those that were not pregnancy associated (e.g., the time interval between the end of pregnancy and maternal death exceeded 1 year).

Of all pregnancy-associated injury deaths (n=1993), 617 (31.0%) women died as a result of homicide, ranking homicide as the second leading cause of total reported injury deaths among pregnant women and postpartum women, following deaths caused by motor vehicle accidents (44.1%). The rest of the pregnancy-associated injury deaths were attributed to unintentional injuries (12.7%), suicide (10.3%), and other (2.0%). Analyses in this report are based on these 617 pregnancy-associated homicide cases, which represent 8.4% of the total 7342 reported deaths. A matched birth certificate was available for 98% (n=305) of these pregnancy-associated homicide deaths that occurred after a live birth (n=311), and a matched fetal death certificate was available for 93% (n=13) of the deaths that occurred after a stillbirth (n=14).

During 1991 through 1999, the overall pregnancy-associated homicide ratio was 1.7 deaths per 100 000 live births (ranging from 0.8–2.2 deaths per 100 000 across the different years). Race was strongly associated with pregnancy-associated homicide deaths (Figure 1). The pregnancy-associated homicide ratio was consistently higher in Black women than in White women over the 9-year surveillance period. The overall ratio for Black women (6.4) was about 7 times higher than that for White women (0.9). Table 1 presents pregnancy-associated homicide ratios for Black and White women by various characteristics at the time of death. Women aged younger than 20 years of all races combined had the highest pregnancy-associated homicide ratio, and the ratio decreased as the woman's age increased. Although the risk among Black women aged younger than 20 years (9.4) was nearly 5 times greater than that for White women aged younger than 20 years (2.0), the racial disparity was the greatest among women aged 25 to 29 years; Black women in this age group were about 11 times as likely to die as a result of homicide as White women (5.5 vs 0.5). Additionally, the racial difference was more pronounced among married women. The pregnancy-associated homicide ratio for Black married women was 7 times the risk for White married women (3.5 vs 0.5). For White and Black women who had never been married or were not married at the time of their death, the mortality ratios were 4 (2.0 vs 0.5) and 2 (7.6 vs 3.5) times

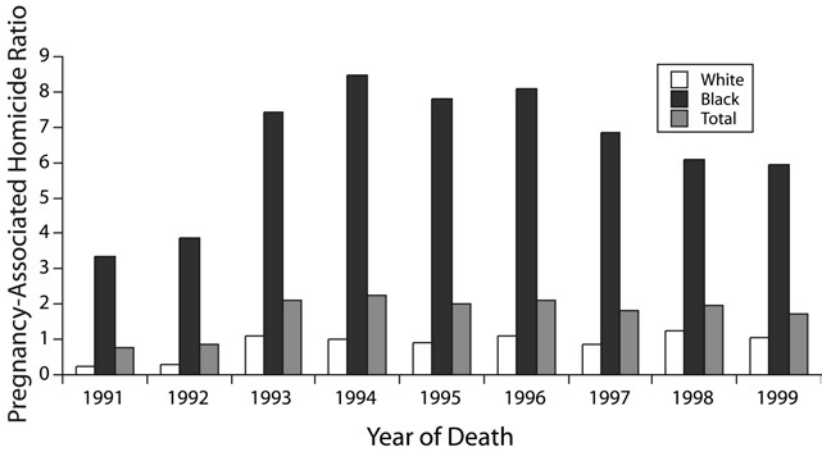

FIGURE 1—Pregnancy-associated homicide ratios, by year and race, United States, 1991–1999.

higher, respectively, than for women who were married.

Among women of all races combined who died as a result of a pregnancy-associated homicide and whose pregnancies ended in a live birth or a stillbirth, 49% started prenatal care in the first trimester, 5% had not received any prenatal care, and 22% had missing data regarding prenatal care. The pregnancy-associated homicide ratios for Black women were higher than those for White women at each level of prenatal care initiation. White and Black women who received no prenatal care had mortality ratios 3 times (1.0 vs 0.3) and more than 2 times (6.6 vs 2.8) higher, respectively, than women who initiated prenatal care during any trimester. For both White and Black women, those who started prenatal care in the first trimester had the lowest mortality ratios. About 22.0% of women died as a result of homicide after their first live-born infant, and 7.0% died as a result of homicide after delivery of a fifth or higher order live-born infant. For 79 (24.0%) birth certificates, no information was given on live birth order. The risk of pregnancy-associated homicide essentially doubled with increasing live-birth order for Black women (2.3–5.0) and for White women (0.2–0.4).

The distribution of the outcome of pregnancy-associated homicides is shown in Table 2. Overall, more than half (52.7%) of the pregnancy-associated homicides occurred during the postpartum period among women who had delivered a live-born (50.4%) or a stillborn infant (2.3%), 20.6% of the deaths occurred while the women were still pregnant (undelivered), and 0.8% occurred among women who had an abortion (Table 2). The time of death was not known for 160 (25.9%) of the women. The distribution of time of death among postpartum women by race was similar for both Black and White women, where pregnancy-associated homicide most frequently occurred during the first 3 months after delivery of a live-born or stillborn infant. However, homicide deaths occurred more frequently among White women (24.8%) during pregnancy than among Black women (17.7%) during pregnancy. Of the 5 women who died as a result of homicide after an abortion, 4 deaths occurred during the first 6 months after the abortion. Information on the gestational age at pregnancy termination was not available.

Overall, firearms (56.6%) were the leading mechanism of pregnancy-associated homicide, followed by cutting/piercing (17.8%) and strangulation (13.9%) (Table 3). The mechanisms used differed somewhat by race and age group of the homicide victims. For women of all age and race groups, firearms were the leading mechanism for pregnancy-associated homicide; this was particularly true for Black women and women younger than 20 years. Cutting/piercing was the second leading mechanism used among Black women (19.4%), whereas strangulation (19.0%) was the second leading mechanism for White women, followed by cutting/piercing (15.7%). Additionally, cutting/piercing was the second most common mechanism used among women aged 20 years and older.

DISCUSSION

Homicide is an infrequent event but is a leading cause of death for women of reproductive age. Each year, more than 6 million American women become pregnant; unfortunately, pregnancy does not exempt women from being victims of homicide. For every 100 000 live births in the United States during 1991 through 1999, there were at least 2 women who died as a result of homicide during pregnancy or within 1 year of pregnancy. Young women, particularly those aged younger than 20 years, and Black women were at the highest risk for pregnancy-associated homicide. Overall, the pregnancy-associated homicide ratios were about 7 times higher among Black women than for White women for every characteristic examined. This finding of racial disparity is consistent with a state-based homicide report for women of all ages,[2] a state-based maternal mortality study,[9] and a 10-city case-control study conducted by McFarlane et al.[16] However, the reasons for disparities could not be determined from the available data.

Of pregnancy-associated homicide deaths that occurred after a live birth or a stillbirth, 43.4% of Black women and 61.7% of White women had initiated prenatal care during the first trimester as recommended. Nevertheless, pregnancy-associated homicide ratios for Black women were higher at each level of prenatal care initiation than they were for White women. In addition, we found that pregnancy-associated homicide ratios were 2 to 5 times higher among women who received no prenatal care compared with those who received any prenatal care during pregnancy, particularly compared with women who started prenatal care in the first trimester.

Literature on violence around the time of pregnancy indicates that 4% to 8% of women are abused during pregnancy, with a majority of perpetrators being intimate partners.[17,18]

TABLE 1—Race-Specific Pregnancy-Associated Homicide Ratios, by Selected Demographic and Pregnancy Characteristics: United States, 1991–1999

	White (n = 242)		Black (n = 361)		Total[a] (n = 617)	
Category	%	Ratio (95% CI)	%	Ratio (95% CI)	%	Ratio (95% CI)
Age group, y						
≤19	25.6	2.0 (1.5, 2.5)	33.0	9.4 (9.3, 9.4)	29.5	4.0 (4.0, 4.0)
20–24	34.7	1.2 (1.0, 1.5)	31.3	6.4 (6.3, 6.4)	32.4	2.2 (2.2, 2.2)
25–29	15.3	0.5 (0.3, 0.6)	19.7	5.5 (4.3, 6.9)	18.6	1.2 (1.1, 1.2)
30–34	15.3	0.6 (0.4, 0.8)	11.6	4.8 (3.5, 6.5)	13.1	1.0 (0.8, 1.2)
≥35	9.1	0.7 (0.4, 1.0)	4.4	3.5 (2.0, 5.7)	6.3	1.0 (0.7, 1.3)
Marital status						
Married	40.9	0.5 (0.4, 0.6)	16.9	3.5 (2.7, 3.5)	27.1	0.7 (0.7, 0.7)
Not married	57.4	2.0 (2.0, 2.0)	82.8	7.6 (7.6, 7.7)	72.1	3.9 (3.9, 3.9)
Missing	1.7	. . .[b] . . .	0.3	. . . . .	0.8	. . . . .
Education[c]						
<12	32.4	1.4 (1.1, 1.8)	28.5	9.0 (7.0, 11.5)	30.1	2.5 (2.5, 2.6)
12	35.8	0.8 (0.6, 1.0)	44.8	6.0 (5.9, 6.0)	40.7	1.6 (1.6, 1.6)
>12	23.7	0.3 (0.2, 0.5)	22.8	3.4 (2.6, 4.5)	23.7	0.7 (0.6, 0.8)
Missing	8.1	3.7 (2.0, 6.3)	3.9	10.1 (4.6, 19.2)	7.2	4.5 (2.8, 6.7)
Prenatal care[d] Initiation (trimester)						
Any care	81.7	0.3 (0.3, 0.4)	70.7	2.8 (2.7, 2.8)	73.5	0.7 (0.7, 0.7)
First	61.7	0.3 (0.2, 0.4)	43.4	2.4 (1.9, 2.9)	49.2	0.6 (0.6, 0.6)
Second	19.1	0.6 (0.4, 0.9)	22.0	3.6 (2.6, 4.8)	20.6	1.3 (1.0, 1.6)
Third	0.9	0.1 (0.0, 0.8)	5.4	4.1 (2.1, 7.4)	3.7	1.1 (0.6, 2.0)
No care	2.6	1.0 (0.2, 3.0)	5.9	6.6 (3.4, 11.5)	4.6	3.1 (1.7, 5.0)
Missing	15.7	3.1 (1.8, 4.8)	23.4	21.4 (15.8, 28.4)	21.9	8.1 (6.3, 10.2)
Live-birth order[d]						
First	19.3	0.2 (0.1, 0.3)	24.4	2.3 (1.7, 3.1)	22.2	0.5 (0.4, 0.6)
Second	31.3	0.4 (0.3, 0.5)	20.5	2.6 (1.8, 3.4)	24.0	0.7 (0.5, 0.8)
Third	20.0	0.5 (0.3, 0.8)	12.2	2.6 (1.7, 3.8)	14.8	0.8 (0.6, 1.1)
Fourth	5.2	0.4 (0.1, 0.8)	8.8	3.9 (2.3, 6.1)	7.4	1.1 (0.7, 1.6)
Fifth or more	3.5	0.4 (0.1, 1.0)	9.8	5.0 (3.1, 7.8)	7.4	1.6 (1.0, 2.4)
Missing	20.9	15.9 (10.1, 23.9)	24.4	139.7 (103.7, 184.2)	24.3	40.1 (31.8, 50.0)
Total	100.0	0.9	100.0	6.4	100.0	1.7

Note. CI = confidence interval.
[a]Includes women of "other" race category.
[b]Denominator has no missing values; therefore, ratio is not available.
[c]Excludes women aged younger than 20 years and excludes women who died in Georgia.
[d]Limited to deaths associated with delivery of a live-born or stillborn infant.

McFarlane et al. found a 3-fold increased risk of homicide (attempted or completed) among women abused during pregnancy than among women who were abused but not during pregnancy.[16,19] It is reasonable to assume that some percentage of the pregnancy-associated homicides we examined are also the result of intimate partner violence, but unfortunately we do not have data in our study to examine the abuse status or victim–perpetrator relationship involved for the pregnancy-associated homicides. Although the effectiveness or safety of screening for partner violence has not yet been determined in clinical trials,[20] it has often been recommended that comprehensive prenatal care include screening for intimate partner violence[16,21] and that care providers consider discussing intimate partner violence, particularly with women who present late in pregnancy.[22,23] The fact that women who receive no prenatal care have the highest risk of pregnancy-associated homicide makes this an even greater challenge for clinical and public health communities, as alternative ways to reach these women need to be found. For over a decade, the American College of Obstetricians and Gynecologists has advocated that medical school curricula address the need to identify abused women and provide standard care accordingly.[24,25] Because an unknown proportion of pregnancy-associated homicides are committed by perpetrators other than intimate partners, it may be worthwhile to consider talking to women in prenatal care about their overall risk of violent assault, not just risk from intimate partners. Because most pregnant women receive prenatal care or visit their health care provider repeatedly during their pregnancy, prenatal and postpartum clinical visits represent an opportunity for discussion about violence and for referral and possible intervention.[11,26,27]

When interpreting this report's finding that homicide is the second leading cause of injury-related death among pregnant and postpartum women, it is important to note that our findings regarding homicides involving pregnant and postpartum women are similar to national statistics[1] on homicide among all women of reproductive age (regardless of whether they are pregnant or not). In the United States, homicide is a leading cause of death among Black and young women (aged 15–24 years), regardless of pregnancy status, and the majority of homicides among all women of reproductive age are carried out with firearms.[2] Despite these similarities regarding risk groups, there are some differences for the risk of homicide among pregnant and postpartum women versus women who have not had recent pregnancies. Krulewitch and colleagues found that in an urban population in which over 80% of pregnancy-associated deaths occurred in minority women, homicides occurred more frequently among pregnant and postpartum women compared with nonpregnant women (43% vs 32%). In addition, those pregnant and postpartum homicide victims were much younger than their nonpregnant counterparts.[21] After adjusting for race and age, the study by Horon and Cheng from Maryland in-

TABLE 2—Distribution of Pregnancy-Associated Homicide Deaths by Time of Death and Race, United States, 1991–1999

	White		Black		All Women[a]	
Time of Death[b]	%	No.	%	No.	%	No.
Undelivered	24.8	60	17.7	64	20.6	127
Postpartum (after delivery of a live-born infant)						
0–3 mo	14.1	34	16.6	60	15.4	95
>3–6 mo	9.5	23	12.5	45	11.2	69
>6–9 mo	10.7	26	11.1	40	10.9	67
>9–12 mo	11.2	27	13.9	50	12.6	78
Missing	0.4	1	0.3	1	0.3	2
Total	45.9	111	54.3	196	50.4	311
Postpartum (after delivery of a stillborn infant)						
0–3 mo	1.2	3	1.7	6	1.6	10
>3–6 mo	0	0	0.3	1	0.2	1
>6–9 mo	0	0	0.3	1	0.2	1
>9–12 mo	0	0	0.3	1	0.2	1
Missing	0.4	1	0	0	0.2	1
Total	1.7	4	2.5	9	2.3	14
Postabortion						
0–3 mo	0.4	1	0.3	1	0.3	2
>3–6 mo	0.8	2	0	0	0.3	2
>6–9 mo	0	0	0	0	0	0
>9–12 mo	0	0	0	0	0	0
Missing	0.4	1	0	0	0.2	1
Total	1.7	4	0.3	1	0.8	5
Unknown	26.0	63	25.2	91	25.9	160
Total[c]	100.0	242	100.0	361	100.0	617

[a]Includes women of "other" race category.
[b]No. days grouped into 3-month intervals.
[c]Total percentages might not add to 100.0 because of rounding.

dicated that homicide is still responsible for a greater proportion of deaths among pregnant and postpartum women (20.2%) than among women who have not been pregnant in the year preceding death (11.2%) (risk ratio=1.8 vs 3.2 before adjustment of race and age).[7] In another analysis, Dietz et al. assessed whether postpartum women were at equal risk for injury death as other women of reproductive age in a state population and found that postpartum women aged 15 to 19 years were at higher risk of being victims of homicide (2.6 times) compared with nonpregnant, nonpostpartum women in the same age group.[9] The relationship between homicide and pregnancy is a complex one, with several factors such as race and age modifying the effect.

Several limitations of the PMSS data should be recognized in the interpretation of this study. Although the PMSS is the most comprehensive pregnancy-associated mortality database available at the national level, reliance on death certificate and birth certificate data is not optimal in 2 areas. The first critical limitation is the fact that not all reporting areas link fetal death or birth certificates with maternal death certificates, and linkage has been shown to increase the ascertainment of maternal deaths by 30% to 150%.[28] Although the CDC requests certificates on deaths during or within a year of pregnancy, including those caused by injuries, information about pregnancy status for women suffering injury deaths can be hard to identify unless a linkage is performed by the reporting area. In addition, the fact that the CDC does not receive cases that the reporting areas might identify through review of autopsy records means most early-gestation pregnancies are missed.[7] Thus, our numbers of pregnancy-associated injury deaths, including those caused by homicide, are underestimated.[29] However, we have no reason to suspect that the risk factors for pregnancy-associated homicide deaths that we found are not accurate.

Given that linking death certificates of women of reproductive age to live birth or fetal death records substantially increases ascertainment of postpartum pregnancy-associated deaths (e.g., deaths associated with live birth or stillbirth outcomes), our findings that more than half of the pregnancy-associated homicides occurred among postpartum women (compared with just one fifth of the women whose deaths occurred during pregnancy) might reflect enhanced ascertainment—and might not be the result of pregnancy being protective, although that might also be the case. More study of those issues is clearly needed. On a similar note, because the inclusive time interval (e.g., the interval between the end of pregnancy and maternal death) used in the pregnancy check box on the death certificate varies by reporting areas, mostly within 90 days or 3 months postpartum,[30] it is not surprising that analysis in this report revealed that pregnancy-associated homicide occurred most frequently during the first 3 months after delivery of a live-born or stillborn infant.

Another limitation to the PMSS is the quality and completeness of data. Death certificate data are acknowledged to be of variable quality. However, Moyer et al. compared the underlying cause of death (injury-related) as determined from death certificates with those determined by an independent review committee and found a high level of agreement for broad and specific categories of suicide and homicide (≥90% sensitivity and specificity).[31] Death certificates and matched birth certificates were our main source of data. We

TABLE 3—Mechanism of Pregnancy-Associated Homicide by Race and Age Group, United States, 1991–1999

	Firearms, %	Cutting/Piercing, %	Strangulation, %	Beating/Battering, %	Others, %	Total, %
Race						
White	49.6	15.7	19.0	11.2	4.5	100.0
Black	61.8	19.4	10.0	5.5	3.3	100.0
Age, y						
≤19	68.1	11.5	14.3	3.3	2.7	100.0
20–24	59.5	18.0	14.0	5.5	3.0	100.0
25–29	51.3	19.1	9.6	14.8	5.2	100.0
30–34	40.7	27.2	18.5	8.6	4.9	100.0
≥35	35.9	23.1	15.4	18.0	7.7	100.0
Total[a]	56.6	17.8	13.9	7.8	3.9	100.0

[a]Includes women of "other" race category.

were limited to variables included in those records and by the fact that they have virtually no information from medical, hospital, or autopsy records or from police investigations. Although the percentage of data missing for each of the variables differed, we have no reason to believe that the missing data are distributed other than randomly. According to the Federal Bureau of Investigation, in 2002, approximately one third (32.1%) of female homicide victims in this country died at the hands of a husband, ex-husband, or boyfriend.[32] In cases of homicide deaths, the PMSS has no information on the relation between the perpetrator and the victim or the history of abuse of the victims, which may be some of the most important risk factors for pregnancy-associated homicide. Furthermore, we do not have data regarding whether the victim's pregnancy status was specifically related to her homicide or whether any of the pregnancy-associated homicides were preventable. The issue of whether pregnant or postpartum women are at increased or decreased risk of homicide compared with nonpregnant women is important but difficult to assess, because there is no standard method with which to identify pregnancy status among women of reproductive age. These are topics for further research.

Because this study is based on data provided voluntarily by state health departments in the 50 states, the District of Columbia, and New York City, methods used to identify pregnancy-associated homicide deaths differed by reporting area. To identify groups as high risk of homicide during pregnancy or within 1 year of pregnancy as well as those individuals prone to commit those homicides, all reporting areas should be encouraged to improve their data on pregnancy-associated homicide deaths. This would require them to use record linkages (e.g., link death certificates with birth and fetal death certificates, with autopsy records, and with police reports) to identify all pregnancy-associated deaths and to obtain more complete information about pregnancy-associated deaths caused by homicide (e.g., victim–perpetrator relationship and the perpetrator's knowledge of the pregnancy) or other types of injury as part of their routine maternal mortality surveillance process.[33]

A new surveillance system, the National Violent Death Reporting System, is currently being developed by the CDC to collect timely information on violent deaths including those from suicide, homicide, undetermined intent, legal intervention, and unintentional firearm injury. The National Violent Death Reporting System includes linked state information from death certificates, medical examiner/coroner files, law enforcement records, and crime laboratories.[34] Although the system has only recently been started, it is designed to enhance our understanding of the scope and nature of violent deaths. Because it can capture information about pregnancy status, victim–perpetrator relationships, and presence of intimate partner violence, it has the potential to strengthen ascertainment and classification of pregnancy-associated homicides. ■

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Contributors

J. Chang originated the study, completed the analyses, and led the writing of the article; C.J Berg, L.E. Saltzman, and J. Herndon assisted with the study and the writing of the article. All authors helped to conceptualize ideas, interpret findings, and review drafts of the article.

Human Participant Protection

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